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Remote Monitoring of Critically Ill Patients via Telecommunication

With the exception of distant EKG telemetry monitoring, modern telemedicine capabilities have not yet been incorporated into the management of patients in an ICU setting. A preliminary Australian project has demonstrated the potential for managing ICU patients in a socialized, regional healthcare system using telemedicine technology.

Military medicine is not well structured to deliver specialist directed on-site intensive care management. There are only a limited number of intensive care specialists available within the military, most located at tertiary care centers. Fellowship trained personnel are assigned to the larger medical centers, leaving community hospitals with neither the staff nor the equipment to handle unstable, critically ill patients.

Yet, unstable, critically ill patients often present to and must receive care in smaller community hospitals and forward deployable mobile hospitals. In order to competently manage the critically ill patient, available personnel must be able to correctly interpret the hemodynamic data from central venous and pulmonary artery catheters. It is difficult to evaluate and treat unstable patients without these skills.

Optimal medical management of the critically ill patient at smaller military community hospitals and forward operational areas is limited by available technical expertise and effective hemodynamic monitoring capabilities. It is well documented that on-site management by specialty-trained intensivists in the intensive care units (ICU) of academic medical centers reduces mortality, decreases length of stay, and improves resource management. Preliminary studies attempting to direct clinical care through telemedicine appear to have both improved delivery of care and reduced operating expenses at remote medical treatment facilities.

We plan to demonstrate that an intensivist can direct the critical care management of unstable, critically ill patients from a distant site by utilizing currently available telemedicine technologies. Acquisition of real-time physiologic and laboratory data and transmission to a central observation point should improve patient care and optimize resource utilization at these community hospitals and mobile units.

In this project, conducting bedside rounds over an ISDN connection facilitated the daily management of critically ill patients and expedited transfer from small community hospitals to tertiary medical centers.

Preliminary results have shown a marked improvement in the nature and frequency of ICU patient transfers. This suggests that the transmission of basic physiologic information can improve the quality of care provided in a regional system. New technologies such as physiologic micro-sensors, miniature transmitters, and wearable computers will become more common and will allow greater insight into the needs of and improved medical care for remote, unstable patients.

An intensive care physician, given the ability to monitor real-time physiologic data and to examine critically ill patients on line, should be able to perform daily rounds and effectively direct the appropriate care and management of unstable patients from a distant site. This should further expedite transfer of the more unstable patients to a tertiary medical center when such is medically appropriate.

This study represents only the first phase of a three-part multi-year project. We will initially validate the efficacy of data acquisition and distant ICU management in a controlled local setting. The second phase will utilize the established technologies to monitor and consult on critically ill patients at smaller community hospitals that lack trained critical care expertise, or at medical centers such as Womack Army Medical Center that have limited intensive care coverage. A final phase would test critical care telemedicine technology in a deployable medical treatment facility. Resources and equipment from the current protocol should be available for use in the later phases.

Funded by
USAMRMC/Telemedicine and Advanced Technology Research Center